C8650-4

Volume 63, Number 9
September 1985

Electric Light & Power

THE NEWS MAGAZINE OF ELECTRIC UTILITY MANAGEMENT AND TECHNOLOGY

© TECHNICAL PUBLISHING

U.S., China sign nuclear cooperation pact

Don Minner
Associate Editor

WASHINGTON, D.C.—A much-needed booster shot was given to the American nuclear power industry in July, when the U.S. and China signed a nuclear cooperation pact that will allow U.S. companies to compete for a potential $6 billion of contracts.

Signed July 23 by U.S. Secretary of Energy John S. Herrington and Chinese Vice Premier Li Peng, the agreement has been sent to Congress, where it must meet House and Senate approval.

"This agreement will go a long way toward opening foreign markets, specifically China, to the American nuclear power industry," said Herrington. "It could help to revitalize the nuclear industry in this country."

The agreement was originally initialed in April 1984 during President Reagan's trip to the People's Republic of China.

Want to double output

The Chinese have plans to double their energy output by the end of the century. DOE stated that China wants to construct as many as eight nuclear plants by the year 2000.

Explained Herrington, "If we take advantage of the many opportunities available to us for energy cooperation and trade, I believe energy can be a cornerstone of strong and prosperous economic ties between our two nations."

DOE said the agreement covers only non-sensitive commercial materials, facilities, components, technology or information exchanged under the accord, none of which can be transferred beyond the boundaries of the recipient nation.

In addition, went on DOE, none of the materials, facilities, components, technology or information exchanged can be used for any nuclear explosive device or any military purpose.

Atomic Industrial Forum (AIF) spokesman Don Winston called the agreement a "hunting license" for U.S. companies.

Building their own reactor

Winston pointed out that the Chinese are currently building a 300 MW reactor at Quingshan in the Hubei province, using their own technology. He said the project, which would be China's first nuclear plant, was started in 1982 and is supposed to be completed in 1989. According to Winston, China plans to build two 900 MW units at Guangdong. The first unit is scheduled to enter commercial operation in 1991 and Unit 2 is expected to go on-line sometime later in the 1990s.

He mentioned that two other 1,000 MW units, Sunan 1 and 2, are planned by the Chinese for southern Jiangsu province.

Winston said the French company Framatome has had serious discussions with the Chinese government about Unit 1 at Guangdong.

American companies are getting a late start on bidding for the Chinese plants. China has had nuclear cooperation agreements with West Germany, France and Japan for several years. Although it hasn't yet signed an agreement, Sweden is attempting to negotiate with China.

Now that the U.S. is involved, Winston believes about eight or nine companies from the four countries will be bidding to supply reactor technology to China.

Assuming that a nuclear plant can be built in China for half the price it can be constructed in the U.S., Winston speculated the four units China currently plans to build will cost about $1.5 billion apiece, resulting in a potential $6 billion in new business.

Winston said the Chinese have expressed an interest in obtaining pressurized water reactors.

"The American companies are coming in late, but they have a lot of technology to offer," said John Callebaut, director of development and governmental relations for the National Council for U.S./China Trade in Washington, D.C.

The council, whose members include Westinghouse and General Electric, helps arrange meetings between U.S. and Chinese companies.

Callebaut warned there may be a "little trouble" in getting the agreement by Congress, because of the accord's nuclear nonproliferation language. He said that some in Washington believe the U.S. didn't get a firm

Continued on page 2

Chinese Vice Premier Li Peng scrutinizes gauges at the New York Power Authority's Niagara Power project with Power Authority Chairman Richard M. Flynn during the premier's July U.S. visit.

EUA offers $65 million for Seabrook shares of 4 utilities

BOSTON—Four New England utilities are close to selling their combined 11.2 percent ownership of the Seabrook nuclear station to Eastern Utilities Associates (EUA).

Central Maine Power Co. (6%), Bangor (ME) Hydro-Electric Co. (2.2%), Maine Public Service Co. (1.5%), and Central Vermont Public Service Co. (1.6%) have signed letters of intent to sell their interest in the plant. EUA, which already owns 2.9 percent of the station, would become the third largest owner of the plant. Public Service of New Hampshire has 35.6 percent and United Illuminating Co., based in New Haven, CT owns 17.5 percent.

Other owners include two utilities in New Hampshire, six in Massachusetts and one in Connecticut.

If the deals are finalized, it should facilitate the necessary regulatory approvals needed to complete the troubled plant.

Central Maine spokesman Peter Thompson said the utility sent its letter of intent to the Maine Public Utilities Commission asking the PUC for a recommendation on how to proceed.

If the Maine PUC says the utility should stay involved in the Seabrook project, Thompson said the utility will consider retaining its interest.

EUA is a Boston-based holding company whose subsidiaries include Blackstone Valley Electric Co., Eastern Edison Co., Montaup Electric Co., and EUA Service Corp.

EUA Vice President of Corporate Relations Webster H. Francis said the company has offered $56 million for the plant interest of the three Maine utilities and $9 million for Central Vermont's share of Seabrook.

Francis said it will cost $54 million to complete the Maine companies' share of the plant and $9 million to finish Central Vermont's portion.

Francis said EUA will be paying 15 cents on the dollar, or about $1,100 per kilowatt for the four utilities' share of the station.

Montaup Electric Co., EUA's subsidiary, will continue to hold the company's original 2.9 percent ownership share of Seabrook. Francis said Mon-

Continued on page 18

Sponsors abandon coal gas plant

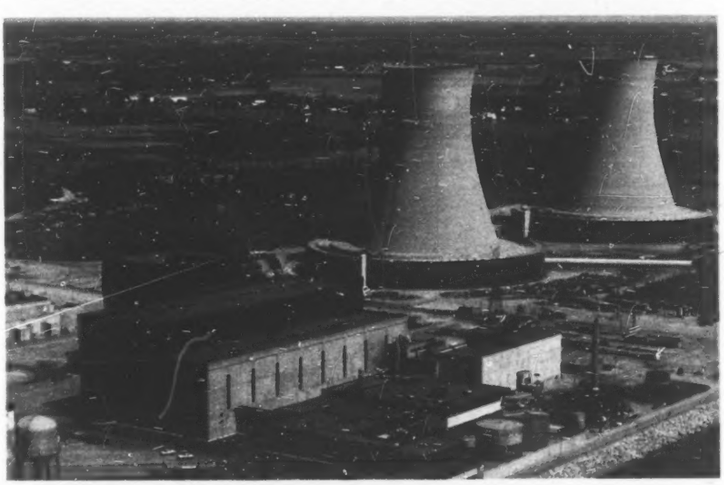
BEAULAH, ND—Sponsors of the Great Plains coal gasification plant announced in late July that they were abandoning the project, leaving operations and responsibility for a $1.5 billion debt in the hands of the U.S. Dept. of Energy.

The abandonment was caused by a decision by Energy Secretary John Herrington not to support the sponsors' request for a $720 million operating subsidy from the Synthetic Fuels Corporation.

The sponsors said they faced debt payments of $500,000 a day and operating losses which were unacceptable. Under the terms of the federally guaranteed loan that provided 75 percent of the financing for the project, the sponsors turned it over to DOE one day before its formal "in-service" date of August 1.

The sponsors are Tenneco Inc., American Natural Resources Co., Transco Energy Co., MidCon Corpo-

Continued on page 16



NRC approves Fermi 2 license

The Nuclear Regulatory Commission unanimously approved a full-power operation license for Detroit Edison's $3.6 billion Fermi 2 nuclear plant in July. The 1,100 MW plant is expected to reach 75 percent of its capacity in late October. It is currently undergoing low-power testing.

Foreign Power Briefs

● **The International Energy Agency** said governments and electric utilities in the industrialized countries should do more to overcome obstacles preventing electricity from making its full contribution to economic development and energy security. According to a new IEA report entitled *Electricity in IEA Countries: Issues and Outlook*, generating capacity in most IEA countries is now more than adequate to meet short-term demand. However, the study warned that future demand growth could absorb this surplus quickly. The report pointed out that much of the excess was accounted for by power plants that were old, oil-fired or environmentally unsuitable. The report said that sustained growth in IEA countries will require increased electricity generation. "Governments should ensure that legislative changes needed to reflect the changing environment in which the electricity industry operates are given high political priority," the study said. Member countries of the IEA are: the U.S., Canada, Japan, Australia, Austria, Belgium, Denmark, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom. Copies of the study are available for $46 from OECD Publications and Information Center, Suite 1207, 1750 Pennsylvania Ave., NW, Washington, D.C. 20006.

● **The Organization for Economic Cooperation and Development (OECD)** said the share of nuclear electricity generated in the industrialized western nations has, for the first time, exceeded the share produced by oil. According to OECD, nuclear generation now accounts for 18 percent of the power produced in OECD member countries, which include the U.S., Japan, Australia, New Zealand and western Europe. Atomic Industrial Forum President Carl Walske said, "The surge of nuclear power production is one of the prime movers in creating the present oil surplus." Nuclear energy accounts for more than 60 percent of the electricity generated in France; more than 50 percent in Belgium; 41 percent in Sweden; 40 percent in Switzerland; 37 percent in Finland; and 34 percent in West Germany.

● **The People's Republic of China** has awarded two contracts worth approximately $9 million to C-E Refractories, a unit of Combustion Engineering, to provide technology, equipment and operator training for two new refractory manufacturing plants. Combustion Engineering also said it signed an agreement with the Chinese to provide components for two coal-fired steam generators that are being designed and manufactured under a long-term technology transfer agreement.

● **The Soviet Union** will allow international inspectors access to two of its nuclear reactors, according to *The New York Times*. The newspaper reported that its sources said the visits by experts from the International Atomic Energy Agency would take place in August. Inspectors were expected to look at two Soviet pressurized water reactors to make sure they are being solely used to generate electricity. *The New York Times* said it would be the first time the Soviets ever allowed inspections of its nuclear installations by outsiders.

● **France's** 1,200 MW Super-Phenix 1 fast breeder reactor will reach criticality by September 15. The Atomic Industrial Forum reports that technicians loaded fuel for the reactor in early August. The breeder, which is being built by an international consortium at Creys-Malville in southern France, is expected to be connected to the French power grid by January 15.

In This Issue

Editorial 4
Calendar 9
Regulatory Review 12
Niagara Mohawk Power has successfully tested a new electronic boiler drum-level gauge system that improves operating control and efficiency.G 20
Some customers of Georgia Power will soon be able to select their own electric rates and level of electric service through their own television sets during a test of a new videotext system.T/D 24
Progress at the pressurized fluidized bed research facility at Grimethorpe England is reported.G 33
New Products 36
Personnel 40
Bulletin Board 41
Readers' Service 43
Management Methods 50

EL&P readers whose responsibilities include both Generation and Transmission/Distribution receive both technology sections. Other readers receive the technology section that applies to their respective area of responsibility. The Generation edition is indicated by a single dot (•) in the upper right corner of page 1; the T/D edition carries two dots (••). All readers receive EL&P's industry news section.

U.S., China agreement . . . from page 1

enough agreement on the weapons transfer clause. However, he believes the agreement will be passed.

During a July 31 hearing on the agreement before the House Committee on Foreign Affairs, Secretary Herrington testified that strong ties between the U.S. and China will "enhance our mutual goal of a strong nuclear nonproliferation regime."

No proliferation risk

Speaking to the nonproliferation question, Herrington said, "We are convinced that there is no significant, proliferation risk in the agreement...and that it will, in fact, provide important benefits in decreasing this risk."

He told the committee members that China recently joined the International Atomic Energy Agency and is clearly committed to nonproliferation. In his testimony, the secretary declared the agreement does not call for any cooperation that is considered sensitive from the standpoint of nonproliferation.

Herrington told the committee that "cooperation in the sensitive areas of the nuclear fuel cycle—including reprocessing technology—is not contemplated under the agreement. Any such transfers would require amendments to the agreement and would therefore be subject to separate review by the Congress."

According to the energy secretary, the agreement "precludes any use of military or explosive use of items..., no material...may be re-exported without prior U.S. consent...(and) prior mututal agreement is required before China can reprocess, enrich or otherwise alter any material subject to this agreement..."

Further congressional hearings were expected to be held sometime in September, according to a staffer of the House Foreign Affairs Committee.

Callebaut feels the pact can only be beneficial for U.S. companies. "American companies are going to get their share of the $6 billion," he assured.

All of the major U.S. nuclear reactor suppliers were pleased with the agreement and anxious to start negotiating with the Chinese.

Combustion Engineering Senior Vice President Shelby T. Brewer described the pact as "a step forward in our nation's revitilization of its leadership position in international nuclear commerce."

In a prepared statement, Brewer said C-E is hopeful Congress will pass the accord.

Potential opportunity

Babcock & Wilcox Vice President and General Manager Charles Pryor stated, "B&W forsees this agreement as a potential opportunity to provide the Chinese with commercial nuclear technology in areas such as equipment, components and services."

Pryor added that B&W "would welcome the opportunity to offer our technology to this market."

A Westinghouse spokesman said, "While U.S. companies will be entering the market late and against strong international competition, the potential benefit to the U.S. in both jobs and improving the trade balance are large."

According to Westinghouse, a new plant order would mean as many as 4,000-5,000 jobs over a five to six year period and up to a $1 billion contribution to relief of the trade imbalance.

The spokesman said Westinghouse is concerned about the head start other countries have had in negotiating with the Chinese.

"It's an uphill struggle," admitted the spokesman, "but this allows us to get in the game."

General Electric's Nuclear Operations division said in a prepared release, "GE has held a number of general discussions with the Chinese in the past. The agreement will now permit us to conduct future talks on a more specific basis. We will be able to better define the opportunities that are available to U.S. firms in the areas of hardware, software and technology exchange programs."

The nuclear cooperation agreement also is expected to open doors to American architect/engineering firms, constructors and consultant companies.

In his congressional testimony, Herrington pointed out that the advantages of the agreement are not limited to nuclear energy. He said many U.S. companies will be competing for other energy business in China, like the estimated $10-15 billion Chinese hydroelectric market.

While in the U.S., the Chinese delegation toured the New York Power Authority's Niagara Power Project, DOE's Fermi National Accelerator Laboratory and Commonwealth Edison's Braidwood nuclear plant.

SERC administrative manager honored

William R. Brownlee (l), administrative manager of the Southeastern Electric Reliability Council since 1971, and former Chairman of Southern Services, Inc., receives certificate of appreciation from E.A. Adomat, SERC chairman and executive vice president of Florida Power & Light. Before assuming administrative responsibility for SERC, Brownlee was an early proponent of reliability planning and was instrumental in the development of area-to-area reliability agreements in 1965, formation of the North American Electric Reliability Council in 1968 and organization of SERC in 1969. Upon retirement next January 31, he will become director emeritus of SERC.

Editorial

T&D Maintenance Management seminar could be a model for industry meetings

After 25 years of monitoring electric utility industry developments and attending industry meetings and conferences, it's hard to really become enthused about another meeting program. Maybe it's age that causes the jaundiced eye, or maybe it's because fewer and fewer things are really unusual, new and worth getting enthused about. But, there are exceptions. There's something quite special about the T&D Maintenance Management workshop—the 10th annual, which will be hosted by Salt River Project in Scottsdale, AZ early next month.

The T&D MM seminar is no high-level meeting of utility executives, where the accent is evenly given to party-line rhetoric and socialization. Nor is it like so many technical "conferences," that may fill up two days with formal presentations around only one or two strong reports to justify members' attendance.

Instead, the MM seminar is a true workshop, with the heavy accent on exchange of useable information, the kind attendees can put to work. It is organized, planned and conducted by and for mid-level managers responsible for T&D system maintenance. It exists without the financial support of a larger organization nor the kind of top management backing that accrues to technical committee activities of those larger regional and national organizations.

In other words, it's a meeting that stands or falls on the value of the information exchanged. No half-day sessions with half days of golf. After the opening day, which will involve inspection tours of four Salt River Project T&D operations, each of the following two days of the meeting is crammed with the kind of information participants can take home and put into action. Some twenty-eight subjects will be presented and discussed. Even coffee breaks and lunch periods are working times. That's when a "swap shop" is conducted to allow participants hands-on exposure to specialized tools, equipment, gadgets and other unique items and ideas members have developed to simplify and improve maintenance operations.

When MM seminar participants return home, they will have gone through the mental equivalent of having run two mini-marathons. They'll be tired. But they'll also be primed to tackle their regular jobs with new perspective and new mental tools. The T&D Maintenance Management seminar is one where participants come away with far more than a dollar's worth of useful information and ideas for each dollar their utility spent for their attendance. That's a lot more than many....even most....industry meetings provide.

Who will judge the judges?

In a recent signed article in *The Wall Street Journal*, Alfred Kahn, former state and federal regulator and now a university professor, decried current regulatory practice, which he says is based on the coin-flip philosophy of heads the consumer wins and tails the utility investor loses. In good times commissions limit how much a utility can earn on its successes, normally to a level well-below what non-regulated enterprises would return to shareholders, with the excess flowing back to consumers in the form of rate reductions. Then in bad times, such as when confronted with the several billion-dollar cost of a new nuclear plant, commissions rule that shareholders must bear the burden of the utilities' failures. This "no win" situation, he says, is based on the view of current commissions that customers should not pay for facilities (especially expensive nuclear plants) that are not "used and useful." Defining prudency, as the used and useful concept does, in effect, on the basis of hindsight and then applying it only to failures is to expropriate shareholder dollars, he says, and investors won't stand still for that very long.

The outcome of the above, unless commissions exhibit some turnaround in philosophy, can only be increasingly poorer electric service, brownouts, more and longer outages, and still higher rates. Ultimately, customers pay for the full cost of electric service, directly or indirectly. Short of government takeover, there is no other source. Failure to recognize this simple economic fact of life is but to hasten the day of reckoning. And when it comes, the role of state regulatory commissions must be considered as a *primary cause*.

Robert A. Lincicome, EL&P Editor-in-Chief

Letters

Fulfilled prophecy

EL&P's August "Urge to merge" editorial opened by reminding of prevailing 'bad because big' public perceptions of electric utilities. This drives me to cite the following quotation that I face daily as it hangs on the office wall before me:

> *Only one danger confronts us: that danger is that the growth of our industry will outrun public understanding, and the people will come to see and fear our size, without understanding our service.*

I wonder if Mr. Owen D. Young, then retired chairman of the General Electric Company, knew just how prophetic these words would be when they were spoken in 1925.

Peter Kushkowski
Executive Assistant
Information Resources Group
Northeast Utilities

Free electric supply market

In response to Mr. Ajat Goyal's letter in the June '85 issue of *EL&P regarding* a "free market" supply system for the sale of electric power, serious consequences exist for the homeowner and industry alike.

Mr. Goyal states that "Homeowners could choose from any reasonable number of energy suppliers servicing their area" and "the power could come from any type of plant, any distance." But who would be able to purchase power generated at a hydroelectric facility that has the lowest cost of generation and therefore the lowest cost to the consumer for basic power? How would buyers be selected up to plant capacity? Would industrial users, with their high usage and therefore greater buying power, be given preferential treatment? These are but a few of the problems in just obtaining electric power. Buyers of 'long distance' power should be charged a surcharge for line losses on a kilowatt-per-100-miles basis, thereby incurring a truer energy usage cost that then would be added to the T&D surcharge.

"The organization that is best able to deliver electric power at lowest cost should be rewarded; the inefficient would die their (un)natural deaths...," states Mr. Goyal. In a choice of "any plant, anywhere," obviously consumers would choose the lowest cost available to them. But what will happen to spinning reserve and peak capacity when the inefficient (plants) are gone, having died 'their (un)natural deaths.'

Perhaps Mr. Goyal would be the first to volunteer to be load shed from the T&D system to reduce peak demand. Most utilities attempt to achieve a balance of efficient generation available to them with the plants they own using a combination of newer, more efficient units as base load and older, less efficient units to operate as load followers to give the consumer the best available cost for his dollar.

What Mr. Goyal really is suggesting is parallel to what the FTC did to AT&T and everyone knows what that has done to our phone bills and service.

Thomas G. Proios
Professional Engineer
Woodhaven, MI

Roberts ok'd for second NRC term

WASHINGTON, D.C.—Thomas M. Roberts was confirmed by the Senate July 8 to serve a second five-year term on the Nuclear Regulatory Commission.

Roberts was first sworn in as a member of the NRC on August 3, 1981.

President and CEO

He served as chief executive officer and president of the Southern Boiler & Tanks Works, Inc. from 1969 to 1978. Roberts also has been an underwriting member of Lloyd's of London and a director of Boyle Investment Company.

Next term to expire

NRC spokesman Robert Newlin said that NRC Chairman Nunzio Palladino's term will expire next year.

Top 100 correction

Consumers Power Co.'s J.H. Campbell unit three should have been listed with the 20 most efficient generating units in the article on operations at the 100 largest investor owned utilities in the August issue of *EL&P*. The table on pages 18 and 19 should have listed Campbell 3 in a tie for 4th place with a heat rate of 9110.

Coal consumption by American Electric Power listed on page 17 and in the table on page 18 should have been 38,351,000 tons, a 5.4 percent increase over 1983.

Electric Light & Power

EL&P. Staff

Vice President and Group Publisher
Robert J. (Duke) Kissel

Sales Manager
Arthur L. Rice

Editor-in-Chief
Robert A. Lincicome

Editorial Staff
Robert W. Smock, Managing Editor
Donald F. Minner, Jr., Associate Editor
Dianne Wilson, Editorial Assistant
Jill F. Buchholz, Editorial Assistant
Elise Girard, Art Director

Contributing Editors
William Kenworthy, Legal/Regulatory
Ted Pollock, Management

Production
Judith S. Schwabe, Regional Director
Laura Smith, Manager

Circulation
Joseph J. Zaccaria, Director

Marketing Services
Margaret Shake, Promotion Manager

Research
Susan Humes, Associate Research Manager

Technical Publishing
A company of The Dun & Bradstreet corporation
Barrington, IL 60010 • (312) 381-1540

ABP
BPA

Advertiser and advertising agency assume liability for all contents (including text representation and illustrations) of advertisements printed, and also assume responsibility for any claims arising therefrom made against the publisher. It is the advertiser's or agency's responsibility to obtain appropriate releases on any items or individuals pictured in the advertisement.

Coal production to soar over next 10 years

WASHINGTON—Utility fuel buyers can look for a thriving coal industry over the next 10 years supplying all the coal they need with little increase in real minemouth prices, according to the latest forecast from the Department of Energy's Energy Information Administration.

Coal industry production is expected to climb from about 900 million tons in 1985 to 1.06 billion tons in 1990 and 1.22 billion tons in 1995—a growth rate of about 3.3 percent per year which is expected to roughly parallel the growth in electricity demand.

Electric utilities will dominate the coal market even more in 1995 than they do now, says EIA. Utilities now account for about 80 percent of coal consumed in the U.S., up from 72 percent in 1975. By 1995 utilities will account for a whopping 86 percent of U.S. coal consumption.

Coal supply should be plentiful and reliable: "The coal industry is expected to produce all the coal demanded by domestic and foreign consumers through 1995...Coal resources are abundant, and considerable excess production capacity exists."

Overall coal production and consumption trends are shown in Table 1. The utility fuel consumption outlook is shown in Table 2.

Utility domination of the coal market results from steady growth in utility consumption while the other sectors are expected to show little growth. Chief casualty is the metallurgical market. In the last 10 years coking plant consumption has fallen in half. Since 1980 22 coke plants have shut down as steel consumption has declined and foreign competitors have taken an increasing share.

EIA expects little growth in the coal synfuels industry. It says the only major plant expected to be in operation in 1995 is the Great Plains coal gasification plant which now faces abandonment (see page 1 story).

Modest growth in exports is expected although the 106 million tons forecasted for 1995 is still short of the record 113 million tons exported in 1981. The export market could fluctuate widely, the EIA report warns, because it is so sensitive to exchange rates, government policies, and future events like the Iranian revolution that triggered the last burst in demand for U.S. steam coal.

The industrial market is also expected to show modest growth in coal demand over the next 10 years.

Utility growth accounts for almost all the growth in coal output, however. Utility consumption is expected to grow by almost 300 million tons per year, from 660 million in 1985 to 950 million in 1995. Coal industry production is expected to grow by 330 million tons per year.

Looking at utility output in Table 2, it is clear that coal accounts for the bulk of growth in utility generation over the next 10 years. Output is expected to be 12 quads per year more in 1995 than in 1984. Half that growth is supplied by coal and one-fourth from increased nuclear output. Slight increases in oil and gas consumption account for the rest.

Coal's share of electricity output is expected to stay fairly constant at about 56 percent, with nuclear's increasing share offsetting the declining share for natural gas and oil.

Increased coal consumption will take place in the 64 GW of new coal fired capacity under construction or definitely planned for operation by 1995, as shown in Table 3.

EIA looks for a two-phase impact on coal demand from these new plants. The first phase will see a boost in consumption of low- and medium-sulfur coal between now and 1990. That's because the new plants coming on line were licensed under the 1971-1978 federal emission control standards that allowed use of low-sulfur coal as a compliance method. In the second phase, from 1990 to 1995, there will be a shift away from low-sulfur coal as plants built under the post-1978 standards requiring scrubbers on all plants start operating.

It should be noted that coal's prospects are even better after 1995 because of the end of the nuclear plant pipeline. All nuclear plants ordered since 1975 have been cancelled and the backlog of pre-1975 orders should be completely built out by 1995. That means nuclear output will peak then and its share of a rising electricity generation market will begin falling. With nuclear as coal's only major competitor for market share, the coast will be clear for coal after 1995.

It should be noted that the EIA forecast is substantially higher than that of the National Coal Association, the coal industry's trade group. NCA says 1995 coal consumption will be only 995 billion tons.

NCA's prediction is the lowest of the major forecasts, however. Major private forecasters Data Resources, Inc and Chase Econometrics Associates, Inc are in substantial agreement with the EIA prediction. DRI sees 1995 coal consumption at 1.072 billion tons and Chase puts it at 1.147 billion tons. NCA, however, is much more optimistic about exports than EIA, estimating that 1995 exports will total 133 million tons.

TABLE 1
U.S. COAL SUPPLY AND DISPOSITION, 1975-1995
(Million Short Tons per Year)

	History		Projections		
Supply and Disposition	1975	1984	1985	1990	1995
Production	655	890	899	1,057	1,221
East	544	584	582	650	731
West	111	306	317	407	490
Net Exports	85	82	72	91	106
Net Storage Withdrawals	-32	-29	15	-8	-6
Total Supply	558	781	842	957	1,110
Consumption by Sector					
Residential and Commercial	9	9	8	7	7
Industrial	64	72	77	89	96
Coking Plants	64	44	46	51	49
Electric Utilities	406	664	709	805	951
Synthetic Fuels	0	2	5	8	8
Total End-Use Consumption	563	791	843	958	1,110

Source: "Annual Outlook for U.S. Coal," May 1985, EIA

TABLE 2
U.S. ELECTRIC UTILITY FUEL CONSUMPTION, 1975-1995
(Quadrillion Btu per Year)

	History		Projections		
Fuels	1975	1984	1985	1990	1995
Coal	8.8	14.1	14.9	16.9	19.9
Oil	3.2	1.3	1.2	1.3	2.0
Natural Gas	3.2	3.2	3.3	3.4	3.9
Nuclear	1.9	3.5	4.1	6.3	7.1
Other	3.3	3.9	3.1	3.3	3.4
Total	20.4	26.0	26.7	31.2	36.3

Source: "Annual Outlook for U.S. Coal," May 1985, EIA

TABLE 3
COAL-FIRED EXISTING CAPACITY AND CAPACITY ADDITIONS BY REGION, 1985-1995
(Gigawatts)

Region	Existing Capacity 1984	Capacity Additions 1985-1995
New England	1.6	0
New York/New Jersey	5.1	0
Middle Atlantic	43.0	5.2
South Atlantic	75.8	18.0
Midwest	84.4	6.3
East of the Mississippi	209.9	29.5
South West	30.2	19.7
Central	27.2	1.4
North Central	19.7	5.8
West	7.0	5.9
North West	1.9	2.1
West of the Mississippi	86.0	34.9
U.S. Total	296.0	64.4

Source: "Annual Outlook for U.S. Coal," May 1985, EIA

Bring back the gas-fired plant option, MIT researchers argue

VANCOUVER, BC—Base-loaded, natural-gas fired, combined-cycle generating units should be put back in the utility capacity planner's arsenal, according to an analysis made by two researchers at the Massachusetts Institute of Technology's Laboratory for Electromagnetic and Electronic Systems.

In a presentation made at the recent IEEE summer power meeting Richard Tabors and Daniel Flagg said their study shows electricity costs could be reduced by 13 percent if natural gas could be used as a fuel for base-loaded power plants coming on line after 1990.

Noting that federal law currently prohibits use of natural gas in new plants, the researchers said, "This decision was based on what now appear to be faulty assumptions concerning gas availability and clearly on faulty assumptions concerning fuel economics."

If utility gas use were unconstrained, 1995 natural gas consumption in the U.S. would increase by only 20 percent, they contended. Utility gas consumption would not quite double over the currently projected level, according to the analysis.

Tabors and Flagg used the Electric Generation Expansion Analysis System developed for EPRI by MIT and Stone & Webster to analyze utility generation options in the period 1990-2004. They studied expansion in the six regional utility system models developed by EPRI for scaled-down modeling of generating systems in the U.S.

Most attractive options

The researchers allowed the program to choose among the five "most attractive" generation options: a 1000-MW PWR (at a capital cost of

Continued on page 32